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GGO#254, 1971. Abstracts.

GENERALIZATION OF THE THEORY OF SCATTERING OF INDUSTRIAL EMISSIONS IN THE ATMOSPHERE. Berlyand, M.Ye. and R.I. Onikul. Trudy GGO, No. 254, 1971, pp. 3-38. TR.647-73; APTIC 48174.

The article presents the results of research conducted for the purpose of developing a precise and generalized method of calculating the scattering of industrial emissions in the atmosphere. Considerable attention is placed for the first time on sources with cold emissions and low, dangerous wind speeds. For this purpose, together with a presentation of calculating formulas for maximum concentration and other characteristics of the field of concentration under unfavorable conditions, consideration is given to the properties of the parameters of the horizontal and vertical turbulent diffusion with a gentle wind, following from the formulas of the semiempirical theory of turbulence, experimental data and considerations of similarity. Attention is also given to problems of scattering of polydispersed dust, and the system of calculation for the case of emissions from tall stacks is further refined.

Various aspects of the scattering of emissions from multiple sources are considered. A satisfactory agreement is found between calculations using experimental data. Consideration is given to practical recommendations that follow from the calculation formulas, especially the different degrees of influence of the number and height of stacks for hot and cold emissions.

2 tables. 10 illustrations. 34 bibliographical entries.

SIMULATION OF ATMOSPHERIC TURBULENT MOVEMENTS ABOVE AN INHOMOGENEOUS SUBJACENT SURFACE. Zrazhevskiy, I.M. and V.V. Klingo. Trudy GGO, No. 254, 1971, pp. 29-56. TR.647A-73; APTIC 47440.

On the basis of a closed system of equations for turbulent movement relative to an average velocity, the second and third single-point moments of

pulsation velocities, dissipation and dissipation currents of turbulent energy, all possible dimensionless combinations are found which can be criteria of similarity for stationary turbulent flow with consideration of the Coriolis force. Criteria of similarity are set forth for a systematized boundary layer of the atmosphere.

A method is presented for simulation of the flow around obstacles in a neutrally stratified boundary layer of the atmosphere.

2 illustrations. 27 bibliographic entries.

EXPERIMENTAL STUDIES OF THE SCATTERING OF COLD VENTILATION EMISSIONS OF VISCOSE FIBER ENTERPRISES IN THE ATMOSPHERE. Vdobin, B.I., I.M. Zrazhevskiy, T.A. Kuz'mina, R.I. Onikul, A.A. Pavlenko, G.A. Panfilova, G.P. Rastorguyeva and B.V. Rikhter. Trudy GGO, No. 254, 1971, pp. 57-71. TR. 6478-73; APTIC 48306.

A methodological description is given of four expeditions conducted by the Main Geophysical Observatory with the participation of the Moscow Scientific Research Institute of Hygiene, the Institute for the Planning of Synthetic Fiber Enterprises, and others. They include a complex study of the characteristics of scattering of cold emissions from synthetic fiber enterprises in the atmosphere. Meteorological and aerological studies were performed, air samples were collected which were analyzed for the carbon disulfide and hydrogen sulfide content. During the sampling period, most of the expeditions measured the amounts of carbon disulfide and hydrogen sulfide that came from tall stacks and measured the temperatures and velocities at which the gas-charged air entered the atmosphere.

The studies were conducted at a great many sources. Positive results were found as far as the use of a balanced method of determination of hydrogen sulfide and carbon disulfide emissions were concerned. The characteristics

of the meteorological conditions could be conveniently represented in the form of tables and graphs, characterizing the number of samples that were selected at different air temperatures, wind speeds and types of stratification.

2 tables. 6 illustrations. 13 bibliographic entries.

TEST OF A METHOD OF CALCULATING SCATTERING OF COLD EMISSIONS IN THE ATMOSPHERE ON THE BASIS OF MATERIALS FROM STUDY OF SYNTHETIC FIBER ENTERPRISES. Baykov, B.K., R.S. Gil'denskiol'd, I.M. Zrazhevskiy. R.I. Onikul and G.A. Panfilova. Grudy GGO, No. 254, 1971, pp. 72-81. TR.647C-73; APTIC 47947.

On the basis of materials from four expeditions in the vicinity of synthetic fiber enterprises, a method of calculating the scattering of cold emissions in the atmosphere which had been devised at the Main Geophysical Observatory was checked. It was shown that when both high and low sources are taken into account there is a satisfactory agreement of the theory and experiment as far as the values of the maximum concentration, the nature of the changes in the concentration with distance, dangerous wind speed, etc. are concerned.

4 illustrations. 5 bibliographic entries.

SPREAD OF HARMFUL IMPURITIES IN THE AREA OF TALL EMISSION SOURCES. Belugina, V.A., N.S. Burenin, P.I. Belikaya and B.B. G[illegible]hko. Trudy GGO, No. 254, 1971, pp. 82-86. TR.647-73D; APTIC 46907.

The article presents a brief description of the performance of an experiment aimed at studying the propagation of the pollutants from tall stacks at the Krivoy Rog State Regional Electric Power Station. On the basis of the results that were obtained, a comparison is made of the concentrations of sulfur dioxide and dust which were obtained as a result of measurements beneath

the plume from the source with calculations. It was found that there is a satisfactory agreement between the measured and calculated concentrations.

1 table. 2 illustrations. 10 bibliographic entries.

STEREOPHOTOGRAMMETRIC STUDY OF AIR FLOW IN THE LAYER OF THE ATMOSPHERE NEAR THE GROUND ABOVE A HILL. Yeliseyev, V.S. Trudy GGO, No. 254, 1971, pp. 87-99. TR.647E-73;

The paper deals with problems of the use of ground stereophotogrammetric recording of smoke trails for studying the wind and turbulent structure of the layer of the atmosphere near the ground. A basis for the development of a method is given and there is an evaluation of the error in determination of instantaneous average and changing wing speed determined on the basis of stereo pictures.

On the basis of a statistical distribution of the components of the wind speed, the necessary number of discrete measurements of the parameters to measured is determined.

An experiment is described aimed at the study of the vertical and horizontal wind profile in the boundary layer of the atmosphere above a hill.

The results obtained make it possible to conclude that there is a definite possibility of using this method for studying the structure of the wind field under complex forms of relief.

4 figures. 19 bibliographic entries.

CHANGES IN WIND DIRECTION IN THE LAYER OF THE ATMOSPHERE NEAR THE GROUND. Zaytsev, A.S. Trudy GGO, No. 254, 1971, pp. 100-103. TR.647-73F; APTIC 48307.

The article presents an analysis of the vertical profiles of the changes in the wind direction in the layer of the atmosphere near the ground on the basis of pibal observations. The relationship of the scatter of the pulsations in the wind direction with absolute value of wind speed and thermal stability is analyzed.

2 tables. 1 illustration. 7 bibliographic entries.

CHARACTERISTICS OF TEMEPRATURE INVERSIONS OF THE AIR NEAR THE GROUND IN THE 0.5-2 METER LAYER (ON THE BASIS OF DATA FROM GRADIENT OBSERVATIONS). Ogneva, T.A. and L.I. Kuznetsova. Trudy GGO, No. 254, 1971, pp. 104-115. not translated. Summarized in AICE, Vol. XIII : 8-17, 1972.

The article presents materials which characterize the recurrence of temperature inversions in the layer of the atmosphere near the ground. They were obtained through an appropriate analysis of the data from special observations of the air temperature at the 0.5 and 2 meter levels and distinguished from the available data in the literature on temperature inversions near the ground that had been obtained primarily by means of measurements of the differences in temperature in the surface of the soil and at the 2 meter level in the air. The recurrence of inversions of differing degrees of intensity is discussed together with their changes on an annual and daily basis as a function of weather conditions and over the territory of the Soviet Union.

The details presented may be used in estimating the possibility of stratification of the atmosphere and the condition of its exchange.

8 tables. 1 illustration. 2 bibliographic entries.

THE VERTICAL STRUCTURE OF THE ENERGY OF TURBULENCE ABOVE A WAVY SURFACE. Ginkhovich, Ye.L. and L.Yu. Preobrazhenskiy. Trudy GGO, No. 254, 1971, pp. 116-120. TR.647-73 G;

The paper presents experimental data on a study of the changes of the level of turbulent energy above a wavy surface. A simple model is posed for describing the relationships obtained.

2 illustrations, 8 bibliographic entries.

SOME POSSIBILITIES OF PREDICTING THE POLLUTANT CONTENT IN URBAN AIR. Son'kin, L.R. Trudy GGO, No. 254, 1971, pp. 121-132. TR.647-73H; APTIC 47352.

On the basis of data from a number of cities, the meteorological conditions which govern the concentration of pollutants in the air are considered. A study is made of the joint influence of various factors on the pollutant content in urban air. It was found that the lack of wind does not cause an increase in accumulation of pollutants in the air if there are no inversions near the ground. Under conditions which are otherwise equal, the content of pollutants in the atmosphere increases with increasing air temperature. A significant influence on the accumulation of pollutants in the layer of the atmosphere near the ground is influenced by the inertial factor. This view is confirmed by the nature of the time correlation function.

On the basis of the conclusions obtained, several rules were formulated for predicting increased pollutant content in the air which have a high degree of reliability.

4 tables. 3 illustrations. 16 bibliographic entries.

STATISTICAL DETERMINATION OF AVERAGE AND MAXIMUM VALUES OF POLLUTANT CONCENTRATION. Bezuglaya, E.Yu. Trudy GGO, No. 254, 1971, pp. 113-139. TR.647-73I; APTIC 46890.

In many cases the distributions of pollutant concentration are described by logarithmically normal laws. It is interesting to determine the maximum concentration qM with a different degree of probability of increase through the values of the average concentration of the pollutant and their dispersal, obtained from experimental data. For convenience and speed in calculating qM, a nomogram was constructed.

It is shown that the mean square deviation is a function of the value of the average concentration of pollutant as well as of the type of pollutant. The greatest degree of variation is shown by sulfur dioxide and soot, and the least by carbon monoxide.

Recommendations are given for planning the operation of observation points to determine the chemical composition of the atmosphere.

1 table. 3 illustrations. 4 bibliographic entries.

THE QUESTION OF SELECTING THE NUMBER OF POINTS FOR COLLECTING SAMPLES AND THE FREQUENCY OF OBSERVATIONS OF ATMOSPHERIC POLLUTION. Goroshko, B.B. Trudy GGO, No. 254, 1971, pp. 140-151. TR.647-73J; APTIC 47616.

On the basis of an analysis of experimental material and conclusions obtained earlier, the principles of organization of sample collection beneath the plume of an individual source are developed. It is shown that it is necessary in this connection to collect samples and make meteorological observations on an hourly basis all during the daylight hours.

Characteristics of the spread of pollutants over the territory of the city are considered. The results of an analysis of experimental data make it

possible to conclude that with a sufficient accuracy of determination of the concentrations during the period of observing pollution in the air basin of the city, it is sufficient to have only one sampling point in an area measuring 10-20 km^2 in a flat terrain and in an area of 5-10 km^2 in an uneven area. A sliding sampling graph makes it possible to obtain data that provide satisfactory characterizations of the degree of pollution of the urban atmosphere.

3 tables. 1 illustration. 23 bibliographic entries.

ANNUAL AND DAILY PATTERN OF THE ATMOSPHERIC POLLUTANT CONTENT IN URBAN CONDITIONS. Bezuglaya, E.Yu., A.A. Gorchiyv and Ye.A. Razbegayeva. Trudy GGO, No. 254, 1971, pp. 152-161. TR.647-73K ; APTIC 47614.

The level of air pollution in cities is subject to considerable variation. Its study is of great importance for planning the operating schedule of industrial enterprises and the effective calculation of meteorological factors.

The study of the daily and annual pattern of sulfur dioxide, nitrous oxide, carbon monoxide and other pollutant concentrations was performed on the basis of the data from systematic measurements performed at stationary points in 50 cities during 1968-1969. Four basic types of seasonal changes in the concentration of pollutants are given. Zones are indicated in which there is a predominance of a certain type of annual pattern of air pollution.

A connection is found between the average monthly values of concentrations of pollutants with recurrence of gentle winds, inversions and fogs.

The most marked daily pattern with clearly pronounced maxima in the morning and evening hours is found in the case of sulfur dioxide concentrations. In cities where emissions through tall stacks predominate, the maximum is due to the increase in the turbulent exchange in the daytime.

The principal emissions of carbon monoxide are due to automobile traffic, so that the concentration maximum during daylight hours may be explained by the fact that the automobile traffic is greatest at that time. No noticeable daily variations in the concentration of nitrous oxide were found.

1 table. 5 illustrations. 13 bibliographic entries.

THE COULOMETRIC METHOD OF DETERMINING THE COMPOUNDS CONTAINING HALIDES IN AIR. Vol'berg, N.Sh. Trudy GGO, No. 254, 1971, pp. 162-171. TR.647. 73 L ; ARTIC 46785.

For continuous determination of the content of free halides in the air, it is recommended the coulometric cell of the non-through type be used, which contains a cathode made of a platinum screen and an anode made of porous silver, applied to graphite by heating. As the non-drying electrolyte, it is suggested that a 25% aqueous solution of lithium chloride be used, containing 0.02% lithium bromide and 4% acetamide.

Determination of hydrogen chloride was conducted following preliminary oxidation of the substance to free halide using a mixture of potassium bromate and lithium chloride, applied to silochrome-3 (hydrothermally processed silica gel with a specific surface of 70 m^2/g).

Chlorinated hydrocarbons were determined following combustion on platinized silica gel at a temperature of 700-800°C to hydrogen chloride, with subsequent oxidation of the latter substance to free halide.

The current yield for the substances for various compounds varied from 80 to 92%. Carbon tetrachloride was not determined under these conditions.

To clean the air which was analyzed for the content of compounds containing halides, for the purpose of removing free halide impurities and

hydrogen halides, it is recommended that a mixture of potassium carbonate and sodium disulfate be used, applied to an inert porous carrier — spherochrome-1 and stained with phenolphthalein.

3 tables. 9 bibliographic entries.

DETERMINATION OF HYDROGEN FLUORIDE IN ATMOSPHERIC AIR. Kuz'mina, T.A. and N.Sh. Vol'berg. Trudy GGO, No. 254, 1971, pp. 172-177. TR. 647-73M. APTIC 46784.

A colorimetric method is proposed for determining the amount of hydrogen fluoride in atmospheric air on the basis of the decrease in the optical density of a complex of zirconyl with xylenol orange in the presence of the fluorine ion. The sensitivity of the method is 0.002 mg/m^3 at a sampling rate of 3 l/min. and a sampling time of 20 minutes. The accuracy of the determination of the maximum permissible concentration for atmospheric air is ± 6%.

The presence of SO_4'' influences the results of the determination of the fluorine ion only at concentrations of SO_4'' on the order of several hundreds of micrograms per milliliter.

The disturbing influence of Al''' may be eliminated by heating the solution to be analyzed with a solution of zirconyl nitrate. In this case, it is possible to determine the fluorine ion in the presence of a twelve times greater amount of aluminum.

2 tables. 4 illustrations. 11 bibliographic entries.

SOME RESULTS OF A DETERMINATION OF THE CONCENTRATION OF SULFUR DIOXIDE IN THE FREE ATMOSPHERE. Petrenchyk, O.P. and V.M. Drozdova. Trudy GGO, No. 254, 1971, pp. 178-183. TR.647-73 N; APTIC 46783.

Results are presented from aircraft measurements of the concentration of sulfur dioxide in the free atmosphere under various meteorological conditions. To determine the concentration of sulfur dioxide, the method of West and Gaeke was used. Under anticyclonic conditions the maximum sulfur dioxide concentration is found in the layer beneath an inversion, and decreases with altitude. Under conditions of a clearly pronounced transport of air masses with highly developed turbulence, there is a nearly uniform distribution of sulfur dioxide with altitude.

2 illustrations. 11 bibliographic entries.

CHARACTERISTICS OF THE CHANGE IN pH IN ATMOSPHERIC PRECIPITATION. Lavrinenko, R.F. Trudy GGO, No. 254, 1971, pp. 184-189. TR.647-73 O; APTIC 46787.

The article discusses the factors and the principal relationships between the ions which determine the pH values in atmospheric precipitation at Leningrad and its vicinity.

2 tables. 2 illustrations. 7 bibliographic entries.

ESTIMATION OF ATMOSPHERIC TURBIDITY ON THE BASIS OF ACTINOMETRIC DATA. Rusina, Ye.N. Trudy GGO, No. 254, 1971, pp. 190-197. TR.647-73 P; APTIC 47362.

The distribution of the turbidity factor over the territory of the Soviet Union in the course of a year is discussed. With a general decrease in turbidity from south to north, middle latitudes constitute the zone where the highest values are found.

The paper presents an analysis of the daily and annual pattern of the turbidity factor. Particular attention is given to an estimate of the degree of pollution in cities on the basis of actinometric data.

4 tables. 2 illustrations. 5 bibliographic entries.

AUTOMATIC GAS ANALYZER AND SOME RESULTS OF RECORDING CARBON MONOXIDE IN ATMOSPHERIC AIR. Pevzner, E.A. and A.S. Zaytsev. Trudy GGO, No. 254, 1971, pp. 198-204. TR.647-739; APTIC 46786.

The article presents the technical characteristics of a gas analyzer that has been devised for continuous recording of carbon monoxide in atmospheric air in industrial cities — the GMK-3. Results are given from an analysis of recordings of carbon monoxide concentrations.

3 illustrations. 6 bibliographic entries.